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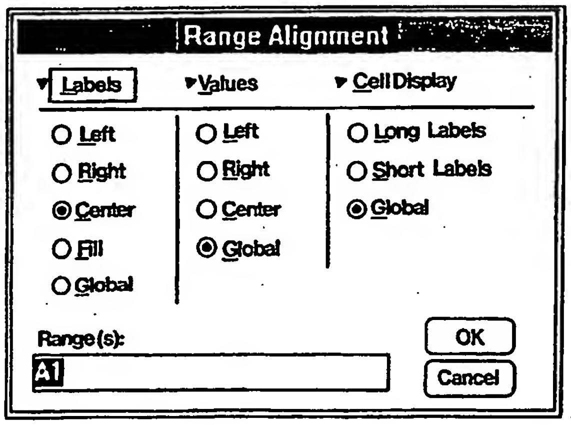
(54) Computer user interface.

(57) A computer user interface that comprises a system and methods to provide a control hierarchy, control marking, a hybrid gammar, and resized and/or repositioned dialog boxes. Control hierarchy divides controls, assigns each control a label, displays the labels according to a design hierarchy, and operates on the controls according to a functional hierarchy. Control marking distinguishes controls, vis addition of graphic elements or changes in labels--referred to as glyphs. Hybrid grammar simultaneously allows a user to specify operations and data objects in a noun verb relationship or verb noun relationship. Finally, resized and/or repositioned dialog boxes enable a user to select a control that requires selection of data objects that are possibly obscured by the dialog box.



Labels: Left / Right / [✓ Center] / Fill / Global
Values: Left / Right / Center / [✓ Global]
Cell Display: Long Labels / Short Labels / [✓ Global]
Range(s): A1

FIG. I

EP 0 428 261 A2

COMPUTER USER INTERFACE

Background of the Invention

The invention relates to the interface between a user and a computer.

The interface between a user and a computer is usually defined by the software application the user is running on the computer. That is, the command structure of the application defines how users initiate commands or choose options and how they respond to the computer's actions in order to manipulate data in the computer.

Some interfaces, however, are defined in part by a window manager such as Presentation Manager® as well as by the particular software application the user is running. The window manager provides support for areas of the screen, i.e., "windows", which in Presentation Manager® include "dialog box windows" and "controls". (Other applications use different terminology to refer to window elements.)

Some elements in the command structure pioneered in the Xerox Star® interface and popularized in the Apple Macintosh® interface are assigned a graphic object, referred to here as a control; which appears in a dialog box. In such an interface, when a user initiates a command, a dialog box appears and the user selects various controls to complete the command. For example, an oval "push button" indicates a command, e.g., "OK" to accept the contents of a dialog box or "Cancel" to escape from a dialog box. A circular "radio button" indicates one of a number of options which are usually mutually exclusive, e.g., one of a number of ways to align text. A square "check box" allows the user to toggle between options. A "list box" lists a plurality of options. And an "edit control box" allows the user to enter and edit text, e.g., a range of cells in a spreadsheet.

To issue a command, then, the user "selects" a control with a mouse, keyboard mnemonic, or similar device. For example, the user can use a mouse to position a cursor over a particular control and then click the mouse buttons to select the control. Or in some interfaces, e.g., Presentation Manager, the user can type a keyboard mnemonic, e.g., a letter of a label that identifies a control, to select the control.

In order for an application to be able to associate a mouse click in a some area of a computer screen or a keyboard mnemonic with a particular control, each control is associated with a control window and each controlwindow is defined by its attributes, e.g., location, contents state, etc. Each control window is in turn associated with a dialog box and its dialog box window.

Summary of the Invention

The invention is a computer user interface" that provides a control hierarchy, i.e., a method of providing a controls in a software application comprising the steps of: dividing the controls into functional hierarchical groups; assigning labels to each of the controls and each of the groups; displaying the labels according to a design hierarchy; and operating on the controls according to the order of the functional hierarchical groups.

The invention further provides control marking, i.e., a method of distinguishing a control within a software application or dialog box, the controls being divided into groups having a hierarchical organization, comprising the steps of: determining which of the of controls are available to a user; generating a glyph for each of the available groups of controls; displaying one of the glyphs in proximity to each of the available groups of controls; accepting a signal from an input device, e.g., a keyboard, mouse, or similar device, to select one of said available groups of controls; removing the glyphs in proximity to each of said available groups of controls; determining in response to the signal which of the controls within the selected group are available to a user; generating a glyph for each of the available controls; displaying the glyphs in proximity to each of the available controls; accepting a signal from an input device to select one of the available controls within the selected group of controls; and removing said glyphs in proximity to each of the available groups of controls.

The feature of control marking further provides a method of implementing a dialog box adapted for use with selections via keystroke mnemonics while at the same time preserving the functionality of selections via a mouse or similar device. The method comprising the steps of: simultaneously displaying a plurality of controls in the dialog box; graphically distinguishing one subset of the controls which is available for selection; enabling selection via keystrokes exclusively from the one subset of controls; in response to a selection from the one subset of controls, graphically distinguishing another subset of said controls; and enabling selection via keystrokes exclusively from said other subset of controls.

The invention further provides a hybrid grammar, i.e., a method of enabling selection among data objects and operations specified within a screen or dialog box comprising the steps of: enabling selection of one of the data objects and then selection of one of the operations to perform on the data object; and enabling selection of one of the operations and then selection of one of the data objects on which to perform the operation.

Finally, the invention provides a method for resizing and/or repositioning dialog boxes in a screen comprising a plurality of data objects and a dialog box comprising a plurality of controls and a plurality of operations. The method comprises the steps of: generating the dialog box; enabling selection of one of the controls within the dialog box wherein the control corresponds to one of the operations and wherein the operation requires selection among said data objects; in response to a selection of the control in the dialog box, altering display of the dialog box, e.g., by resizing the dialog box or repositioning the dialog box; enabling selection of the data objects within the screen; in response to a selection of the data objects within the screen, again altering display of the dialog box; and executing said operation on said selected data objects.

These and other features and advantages of the present invention will be apparent from the following description of a presently preferred embodiment and from the claims.

Description of the Preferred Embodiment

Fig. 1 is a pictorial representation of a screen that shows a dialog box that uses a control hierarchy according to the interface of the present invention.

Fig. 2 is a pictorial representation of a screen that shows a dialog box having control marking as defined by the interface.

Fig. 3 is a pictorial representation of a screen that shows a dialog box that uses hybrid grammar according to the interface.

Figs. 4 and 5 are pictorial representations of screens that show a dialog box resized and repositioned according to the interface.

Fig. 6 is a block diagram that shows the modules of the interface and the general message flow of a system according to the present invention.

Fig. 7 is a definitions file produced by the application module of the system.

The present invention provides an interface between a computer and a user. Although the interface is described below in connection with a window manager (i.e., Presentation Manager®) and a software application that provides spreadsheets (i.e., Lotus 1-2-3/G™), the use of the window manager and the focus on spreadsheet applications is in no way intended to limit the scope of the invention.

Control Hierarchy

The interface provides a "control hierarchy" which divides controls into groups and separates groups of controls within a dialog box. other systems separate controls into groups for visual purposes, but the present invention separates controls in order to impose functionality, i.e., logical and operational structure on the controls. Separating groups of controls better ensures that each group of controls and each control within a group has an unique mnemonic, preferably a first letter mnemonic, and allows the application's designer to structure the dialog box in a logical fashion. The hierarchy and selection of unique mnemonics is described below in connection with Figs. 1 and 2.

Referring to Fig. 1, a dialog box "Range Alignment" is shown. A user selects a group of controls in the dialog cursor on the group and pressing ENTER; or by positioning a mouse pointer over the group and clicking a mouse button. For example, "L" selects the "Labels" group. Once the user has selected a group, if the user selects another control by typing another mnemonic, he selects a control within the selected group. For example, referring to Fig. 2, if the user has selected the "Labels" group, and then the user types "C", he selects the "Center" control under "Labels", not the "Center" control under "Values". Thus, the hierarchical structure allows controls in different groups to have the same mnemonic. For example, the controls "Left", "Left", and "Long Labels" all have the same mnemonic "L" but each mnemonic is unique within its group. This approach differs from prior approaches in which there is a single hierarchy (all controls being within that hierarchy) and all controls are available for selection via a keystroke mnemonic. Note that the approach of the present interface applies to keystrokes, i.e., keystroke mnemonics. Selections via a mouse pointer are not restricted by control hierarchy.

A visual design hierarchy communicates the hierarchy of controls in a dialog box via consistent layout and symbols. For example, as shown in Figs. 1 and 2, gray horizontal lines separate levels of a hierarchy, while black vertical lines separate peers in a hierarchy. So-called "white space", e. g., the space that separates the "OK" and "Cancel" push buttons from the "Range(s)" edit control box, separates controls that require visual grouping unrelated to the mnemonic hierarchy.

Control Marking

The interface also provides a method of "control marking" that distinguishes which controls a user can selected via keystroke mnemonics at a particular time by placing a "glyph", e.g., a graphic symbol such as a small triangle or an underline, near the label of each available control. Alternatively, available controls can be marked by changing the label of each control, e.g., by changing the font or color of all or part of the label. Labels thus changed are also referred to herein as glyphs.

Glyphs dynamically appear and disappear to indicate which controls are available as the user enters successive keystroke mnemonics. For example, referring again to Fig. 1, the user has just called up the dialog box "Range Alignment". The initial focus of the controls is the label identifying one group of controls in the dialog box, i.e., "Labels". The focus is emphasized by placing the group title inside a dotted border, according to a window manager default behavior. In addition to the default behavior, however, the interface places glyphs near each of the group controls, "Labels," "Values," and "Cell Display," to indicate that they can be selected via keystrokes. This differs from default convention in which all controls have equal hierarchy and are equally available. Here, the marked controls are the only controls available.

Once the user selects one of the controls available in Fig. 1, however, the interface marks the controls within the group with glyphs. Referring to Fig. 2, for example, if a user selects the "Labels" control in Fig. 1, the initial focus is again moved to the first control within the selected group, i.e., "Left" is emphasized by placing the default setting, however, the interface places glyphs near the "Left," "Right," "Center," "Fill," and "Global," controls to indicate that they are available.

In the illustrated embodiment, the labels for the controls have underscores at all times to indicate the keystroke mnemonics that select the controls. Therefore, the glyphs herein are provided *in addition* to the underscores. That is, glyphs dynamically change to indicate available groups of controls while the underscores remain present for all controls--even those that are not available.

An alternative embodiment would dispense with separate glyphs, e.g., triangle glyphs, and employ dynamic rather than static underscoring. This is accomplished by applying underscoring only to available groups of controls. In this alternative embodiment, the underscore serves two functions, i.e., to indicate the members of the available group of controls as well as the mnemonics. An added benefit of the alternative is that unavailable mnemonics are not displayed at the same time as available ones. However, the underscore is, of course, only one way of indicating the mnemonic. As mentioned above, other ways include changing the color or font of the mnemonic character in a label, for example. Any of these other ways also indicate which mnemonics are available to the user and are a dynamic means of indicating the available control groups as well as indicating the mnemonics for selecting the individual controls.

In general, the interface and its associated software application use hierarchical dialog boxes that provide a user with the mnemonics necessary to maintain keystroke compatibility with a previous version of a software application that does not use dialog boxes, e.g., as with Lotus software 1-2-3/G™ and its predecessor 1-2-3®. The interface also provides improved support for keyboard use of an interface that uses dialog boxes.

Verb/Noun and Noun/Verb Hybrid Grammar

The interface of the present invention uses a hybrid grammar which allows the user to initiate actions in either a "verb noun" or "noun verb" approach. The hybrid grammar effectively combines the verb noun approach used in previous software applications and the noun verb approach used in Presentation Manager6 and object oriented programming applications. In the verb noun approach, the user selects a command (verb) and then the object of the command (noun), e.g. "ERASE" followed by a specified range of spreadsheet data to erase. In the noun verb approach, the user selects an object (noun) and then specifies what to do (verb) with the object. For example, to erase the contents of a range of spreadsheet cells, the user selects the range and then initiates the erase command.

In the hybrid grammar approach, the interface prompts the user to select an object after he selects a command, as in the verb noun approach. However, the user can select an object before issuing a command, as in the noun verb approach. For example, referring to Fig. 3, the user can issue the "Range Zero Suppress" command which calls up the "Range Zero Suppress" dialog box and then select a range of cells on which to perform the option--a verb noun approach. On the other hand, the user can select a range of cells and issue the "Range Zero Suppress" command which calls up the "Range Zero Suppress" dialog box--a noun verb approach. In both cases, the selected range or a default range is automatically written into an edit control box that specifies the selection, e.g., "Ranges" in Fig. 3, and the user can then select the commands to perform on the range. In the verb noun approach the user can change the selection, whereas in the noun verb approach the user need not change the selection having already selected the relevant data prior to invoking the option.

Resized Dialog Boxes

The interface also automatically resizes and/or repositions a dialog box that interferes with completion of an operation. For example, referring to Fig. 4, the dialog box "Data Fill" covers a part of the spreadsheet from which the range of cells for the edit box "Selection" is to be selected, making it difficult for the user to be sure of what cells he wants to select. Referring to Fig. 5, then, once the user selects the edit control box "Selection" in Fig. 4, the interface automatically resizes and/or repositions the dialog box, so that it covers less of the spreadsheet and the user can more easily select a range of cells. Once the user has selected a range of cells, the dialog box is returned to its original size and position. Alternatively, the interface can remove the dialog box from the screen entirely and replace it once the operation is complete.

In addition, note that the resizing feature aids the full verb noun and noun verb functionality from within the context of a dialog box described above. In the past, for example, the user would have had to define a range before invoking the dialog box that operates on the range.

Detailed Description of the Interface Implementation

The interface system of the present invention is "event driven." That is, the actions of the interface are based on a software application's definition of a dialog box and controls within the dialog box, the processing of events caused by a user's interaction with the controls in the dialog box, and the processing of messages resulting from toe events. The various components of the interface and the processing of events and messages are described below in connection with Fig. 6.

Referring to Fig. 6, an interface system 10 includes a main body 11 of a software application and an operating system and window manager 12 (OS/WM), e.g., OS/2® and Presentation Manager®, which controls the primitive operations that generate control windows and dialog box windows. The main body 11 calls a HDB manager dialog box loader 13 which loads and displays the dialog box and starts message handling. A dialog box procedure 14 in the software application presents the dialog boxes and controls within the windows generated by the OS/WM 12. For example, referring to Fig. 2, the OS/WM 12 generates the dialog box window in which the 1-2-3/G™ spreadsheet application presents a "Range Alignment" dialog box. The OS/WM 12 also generates the control box windows within the dialog box window and each control window contains a control. For example, in the "Range Alignment" dialog box there are a number of controls including the commands "OK" and "Cancel", sthe options "Left", "Right", "Center", and "Fill", and the edit control box "Range(s)".

Also, referring to Fig. 6, the software application 14 defines the attributes of each control window and dialog box window in a definitions file 16. The attributes include, for example, location, boundaries, type, contents, state, and relation to other windows (referred to as "hierarchy"). For example, the control window for "Fill" in Fig. 2 has the type "option" and the contents "Fill"; its state is checked or unchecked; and it is hierarchically organized under the "Labels" control window.

The hierarchical relationship between the controls in the dialog box is established by arranging the statements in the definitions file 16 according to the arrangement of controls in the dialog box. A sample definitions file is shown in Fig. 7. For example, referring to Fig. 7, a statement uses the hierarchical BEGIN and END keywords (or '{' and '}') to delimit the start and end of a level in the hierarchy respectively and BEGIN/END blocks are nested in tree-like fashion in order to represent the levels of the hierarchy. Controls that are identified by statements between the BEGIN/END block represent child windows of the parent window denoted by the CONTROL or DIALOG statement that immediately precedes the BEGIN/END block. The processing of "events" within these windows and "messages" resulting from the events is described next.

An "event" is some action taken within the boundaries of a window. For example, an event occurs when a user selects a control, such as when a user positions a mouse on a radio button and clicks the mouse button. example, the selection might generate messages that instruct the OS/WM 12 to redraw the control window in a different state, e.g., selected, and instruct the application 14 to take the action associated with the control window.

Referring again to Fig. 6, when a user selects one of the controls, the OS/WM 12 produces a number of messages instructing the OS/WM 12 and the application 14 on how to respond to the selection. For example, if the user selects the "Labels" option and then the "Center" option in the "Range Alignment" dialog box, messages are generated instructing the window manager 12 to move the input focus to the "Center" control window and instructing a hierarchical dialog box manager (HDBM) described below to mark the controls in the "Labels" group with glyphs and instructing the application 14 to center the alignment of the labels in a spreadsheet.

Before and after the messages reach or are sent to the application 14, however, the HDBM filters the messages from the OS/WM 12 so that both the application 14 and the OS/WM 12 receive only relevant messages. For example, HDBM might use an initialization message sent from the OS/WM 12 to autoposition the dialog window to an area of the screen when the window becomes visible.

The HDBM is an extension of the window manager in OS/WM 12. The window manager, e.g., presentation Manager®, has its own dialog box manager. However, HDBM supports the hierarchical keystroke mnemonics described above in connection with Control Hierarchy and Control Marking. In addition, the HDBM provides access to a group of control windows contained within the dialog box that are not part of sthe hierarchy, e.g., "OK" and "Cancel" controls and fully maintains the standard presentation managerc mouse selection and pointing conventions for dialog boxes.

Referring again to Fig. 6, note that the HDBM is divided into two parts, namely the Front End Filter 18 and the Back End Filter 20. The Front End Filter 18 filters the messages from the OS/WM 12, routes or translates if necessary the relevant messages for the application 14, and then passes the messages to the application.

At run-time, the HDBM dialog box loader 13 captures and uses the parent/child arrangement of the controls specif ied in the definitions file 16 to graph the hierarchy of the dialog box so the HDBM can "navigate" between controls, i.e., move from one group of controls to another in proper sequence and move from one control to another within a group. Once the HDBM dialog box loader 13 has captured the hierarchical relationship between the controls, it "flattens" the dialog box window by making all the controls within the window children of the dialog window. This is done to simplify the message protocol imposed by the window manager 12 and controlled by the application 14 when creating and/or processing the dialog box.

Next, the application 14 filters and translates the messages it receives from the Front End Filter 18. The application 14, based on the definitions of the dialog box window and control windows in the definition file 16, executes any application specific operations on the affected control window and dialog box window. For example, the application 14 might validate text in a edit control box.

Next, the application 14 passes any messages that are not relevant, e.g., OS/WM primitive operations, to the Back End Filter 20. The Back End Filter 20 filters the messages and executes hierarchical operations. For example, if the selection of one control makes it impossible to select a second control, the Back End Filter 20 removes a glyph from the second control. Finally, the Back End Filter 20 passes the messages to the OS/WM 12 for any default processing that may be needed.

In addition, the HDBM fields all mouse events and keystroke events while the dialog box is active. If a control"windowthat supports selection outside the dialog box has the input focus, a mouse event or certain keystroke events cause the dialog box to be resized and/or repositioned as described above. when the events indicating that the selection has been completed are received by the HDBM, the dialog box is restored to its original size and position. The resizing and repositioning is a low priority activity so that if the events indicating the selection have been completed are received prior to the onset of the resizing and repositioning of the dialog box, the resizing and repositioning do not take place.

Further, in connection with the noun verb and verb noun grammar, the application main body 11 supplies the dialog box with the object that the user has selected prior to issuing the command that invoked the dialog box so that the edit control box specifying the selection can be initialized accordingly with the current object.

Other embodiments are within the following claims.

Claims

1. A method of providing a plurality of controls in a software application comprising the steps of:
dividing said controls into functional hierarchical groups;
assigning labels to each of said controls and each of said groups;
displaying said labels according to a design hierarchy; and
operating on said controls according to said functional hierarchical groups.
2. A method of displaying a plurality of controls in a software application some of which are available comprising the steps of:
determining which of said controls are available at particular time;
generating a glyph for each of said available controls at said time; and
displaying one of said glyphs in proximity to each of said available controls at said time.
3. A method of displaying a plurality of controls in a dialog box some of which are available comprising the steps of:
determining which of said controls are available at a particular time;
generating a glyph for each of said available controls at said time; and

displaying one of said glyphs in proximity to each of said available controls at said time.

4. A method of selecting a control from a plurality of controls in a software application, said controls being divided into groups having a hierarchical organization, comprising the steps of:
determining which of said groups of controls are available to a user;
generating a glyph for each of said available groups of controls;
displaying one of said glyphs in proximity to each of said available groups of controls;
accepting a signal from an input device to select one of said available groups of controls;
removing said glyphs in proximity to each of said available groups of controls;
determining in response to said signal which of said controls within said selected group are available to a user;
generating a glyph for each of said available controls;
displaying said glyphs in proximity to each of said available controls;
accepting a signal from an input device to select one of said available controls within said selected group of controls; and
removing said glyphs in proximity to each of said available groups of controls.

5. A method of selecting a control from a plurality of controls in a dialog box, said controls being divided into groups having a hierarchical organization, comprising the steps of:
determining which of said groups of controls are available to a user;
generating a glyph for each of said available groups of controls;
displaying one of said glyphs in proximity to each of said available groups of controls;
accepting a signal from an input device to select one of said available groups of controls;
removing said glyphs in proximity to each of said available groups of controls;
determining in response to said signal which of said controls within said selected group are available to a user;
generating a glyph for each of said available controls;
displaying said glyphs in proximity to each of said available controls;
accepting a signal from an input device to select one of said available controls within said selected group of controls; and
removing said glyphs in proximity to each of said available groups of controls.

6. The method of claim 4 or claim 5 wherein said input device is a keyboard, mouse, or similar device.

7. The method of claim 4 or claim 5 wherein said signals are made via a keyboard, mouse or similar device, or a combination thereof.

8. A method of implementing a dialog box comprising the steps of: simultaneously displaying a plurality of controls in said dialog box;
graphically distinguishing one subset of said controls which is available for selection;
enabling selection via keystrokes exclusively from said one subset of controls;
in response to a selection from said one subset of controls, graphically distinguishing another subset of said controls; and
enabling selection via keystrokes exclusively from said other subset of controls.

9. The method of claim 8 further comprising the step of simultaneously accepting input from a pointing device to select any one of said plurality of controls regardless of limitations placed on selection via keystrokes.

10. The method of claim 8 wherein said controls are represented by labels.

11. The method of claim 8 wherein said controls are graphically distinguished with identical glyphs.

12. A method of enabling selection among data objects and operations specified within a screen comprising the steps of simultaneously:
enabling selection of one of said data objects and then selection of one of said operations to perform on said data object; and
enabling selection of one of said operations and then selection of one of said data objects on which to perform said operation.

13. A method of enabling selection among data objects and operations specified within a dialog box comprising the steps of simultaneously:
enabling selection of one of said data objects and then selection of one of said operations to perform on said data object; and
enabling selection of one of said operations and then selection of one of said data objects on which to perform said operation.

14. A method of implementing a screen comprising a plurality of data objects and a dialog box comprising a plurality of controls and a plurality of operations comprising the steps of:
generating said dialog box;
enabling selection of one of said controls within said dialog box wherein said control corresponds to one of said operations and wherein said operation requires selection among said data objects;
in response to a selection of said control in said dialog box, altering display of said dialog box;
enabling selection of said data objects within said screen;
in response to a selection of said data objects within said screen, altering display of said dialog box; and
executing said operation on said selected data ob-

jects.

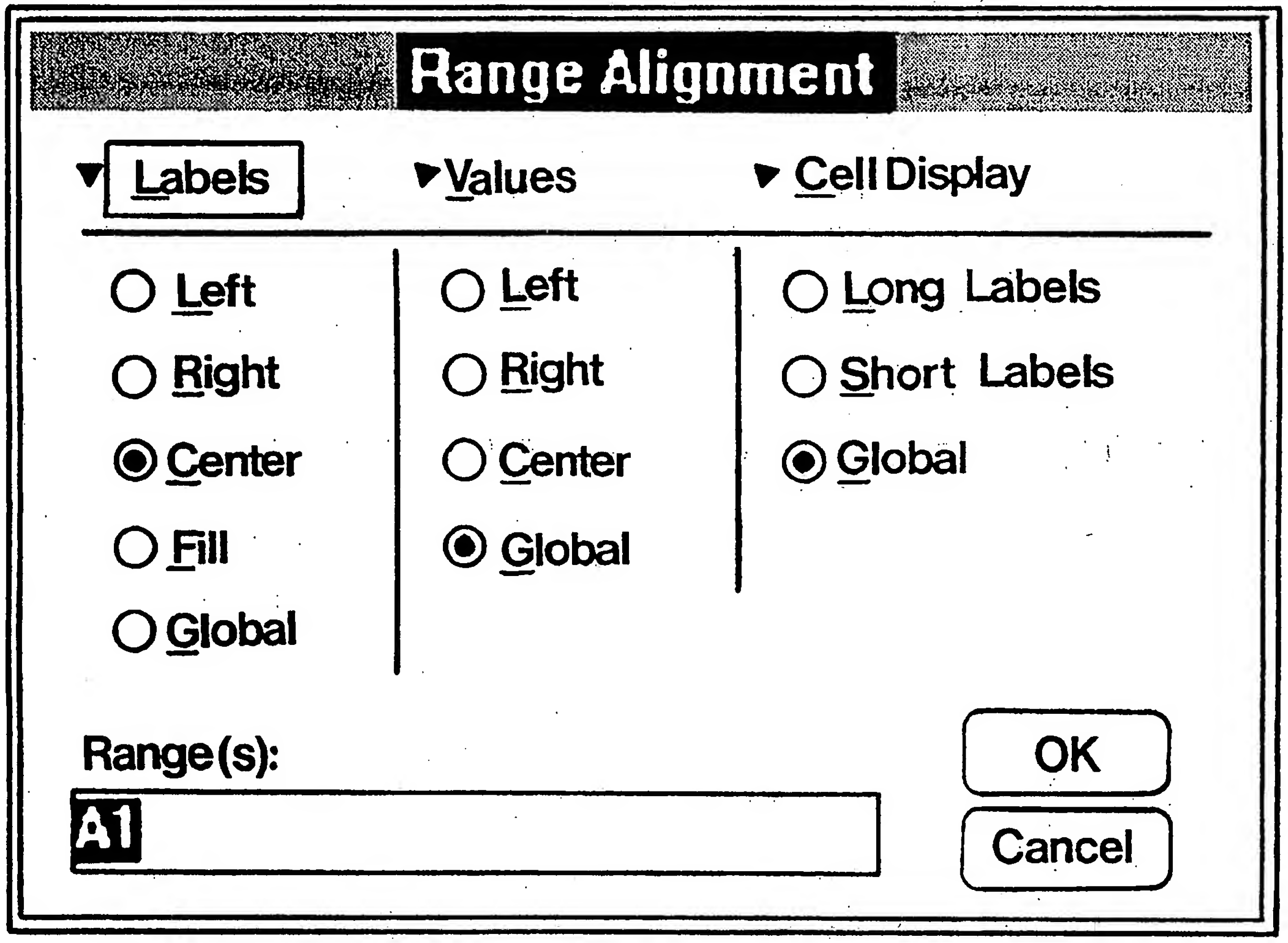
15. The method of 14 wherein said dialog box is altered by automatically resizing said dialog box.

16. The method of 14 wherein said dialog box is altered by automatically repositioning said dialog box.

17. A computer user interface comprising an operating system which provides messages from said user to said computer;

a window manager which operates on said messages to create a plurality of windows that contain a plurality of controls;

a definitions file which defines a plurality of attributes for each control and a hierarchical relationship of each control to one or more of said controls; and an interface module which provides methods of distinguishing said controls, selecting said controls, and performs a plurality of operations on said controls.



Range Alignment

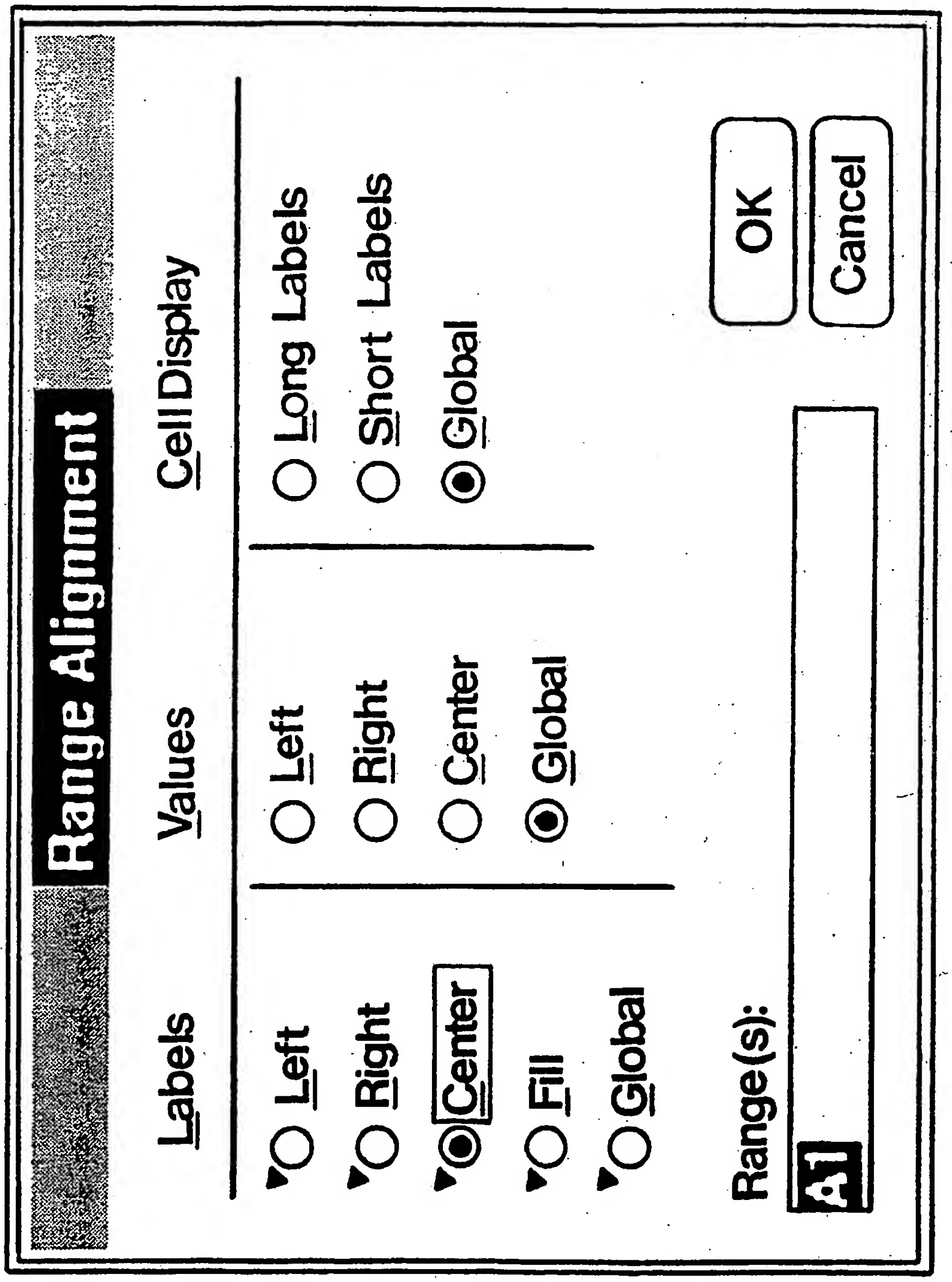
▼ Labels
- ○ Left
- ○ Right
- ● Center
- ○ Fill
- ○ Global

▼ Values
- ○ Left
- ○ Right
- ○ Center
- ● Global

▼ Cell Display
- ○ Long Labels
- ○ Short Labels
- ● Global

Range(s): A1

FIG. I

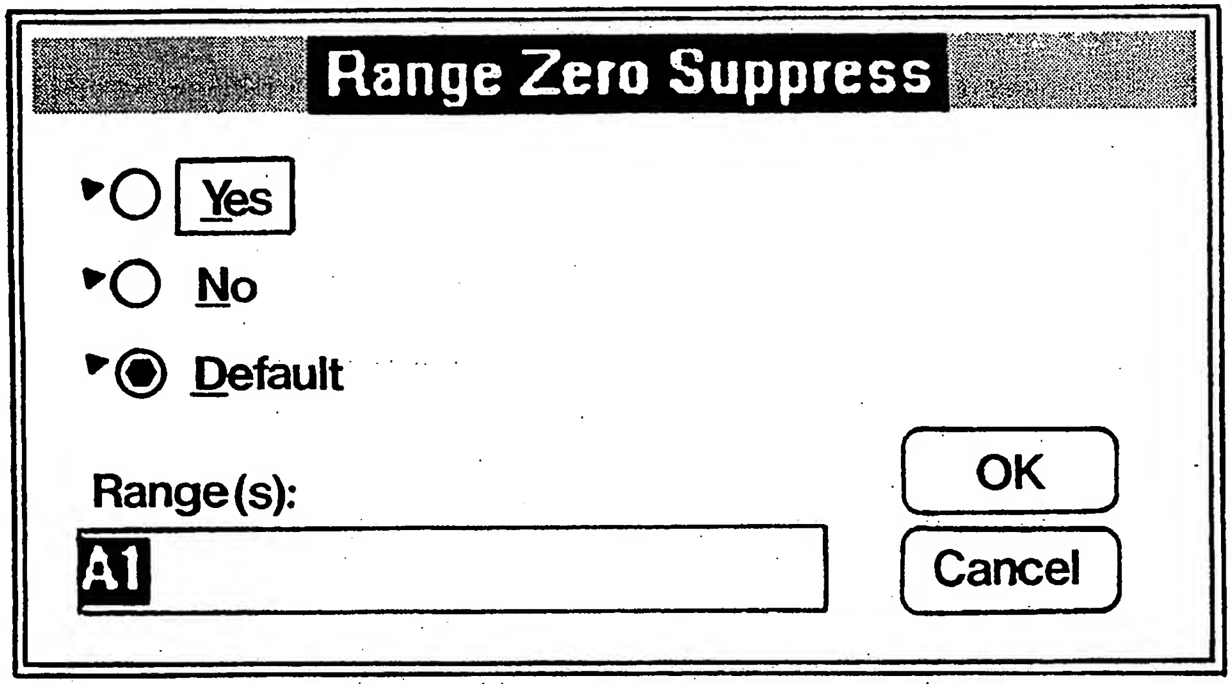


Range Alignment

Labels	Values	Cell Display
○ Left	○ Left	○ Long Labels
○ Right	○ Right	○ Short Labels
● Center	○ Center	● Global
○ Fill	● Global	
○ Global		

Range(s): A1

FIG. 2



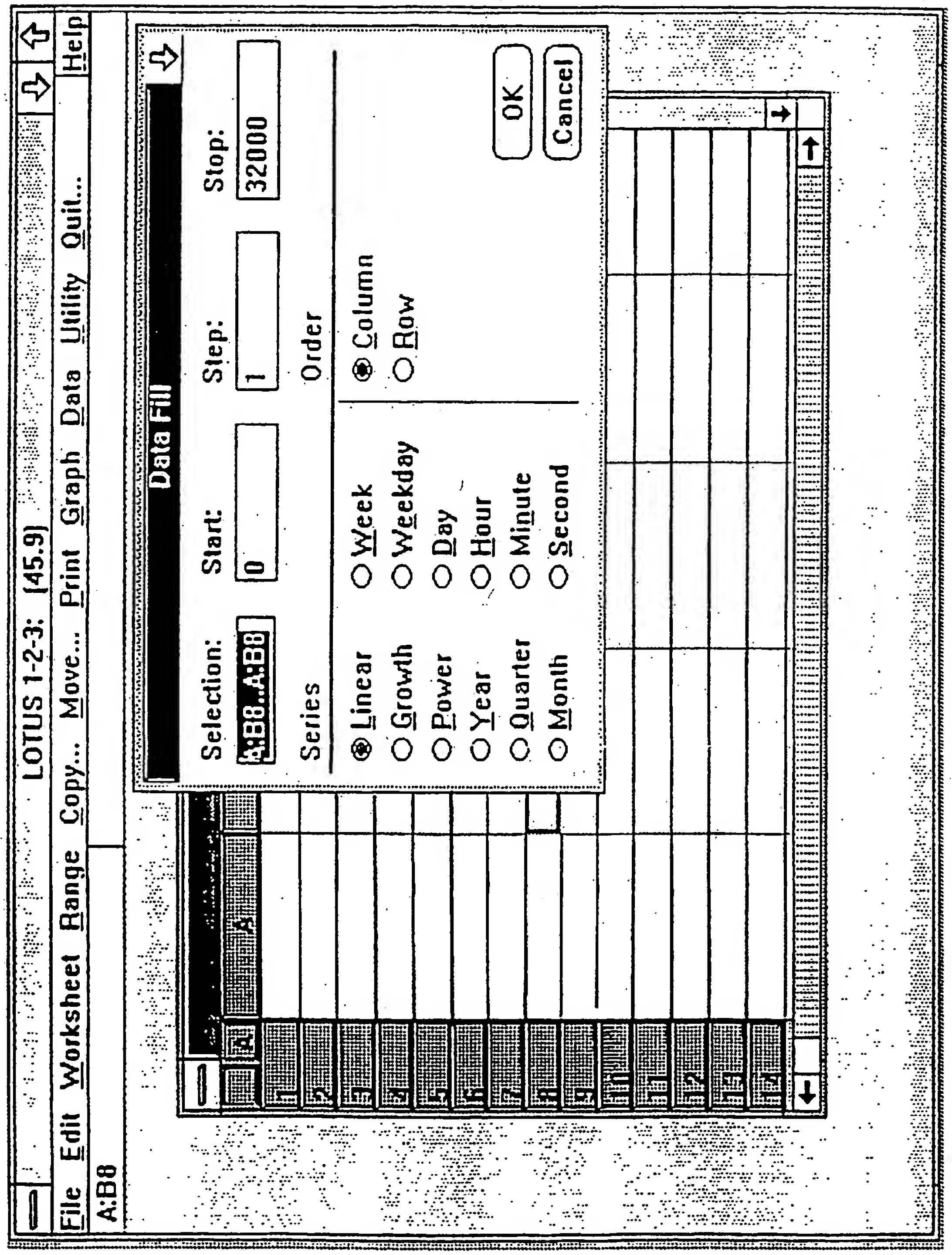
Range Zero Suppress

Yes No [✓ Default]

Range(s): A1

FIG. 3

FIG.4



Selection: A:B8..A:B8

Start: 0

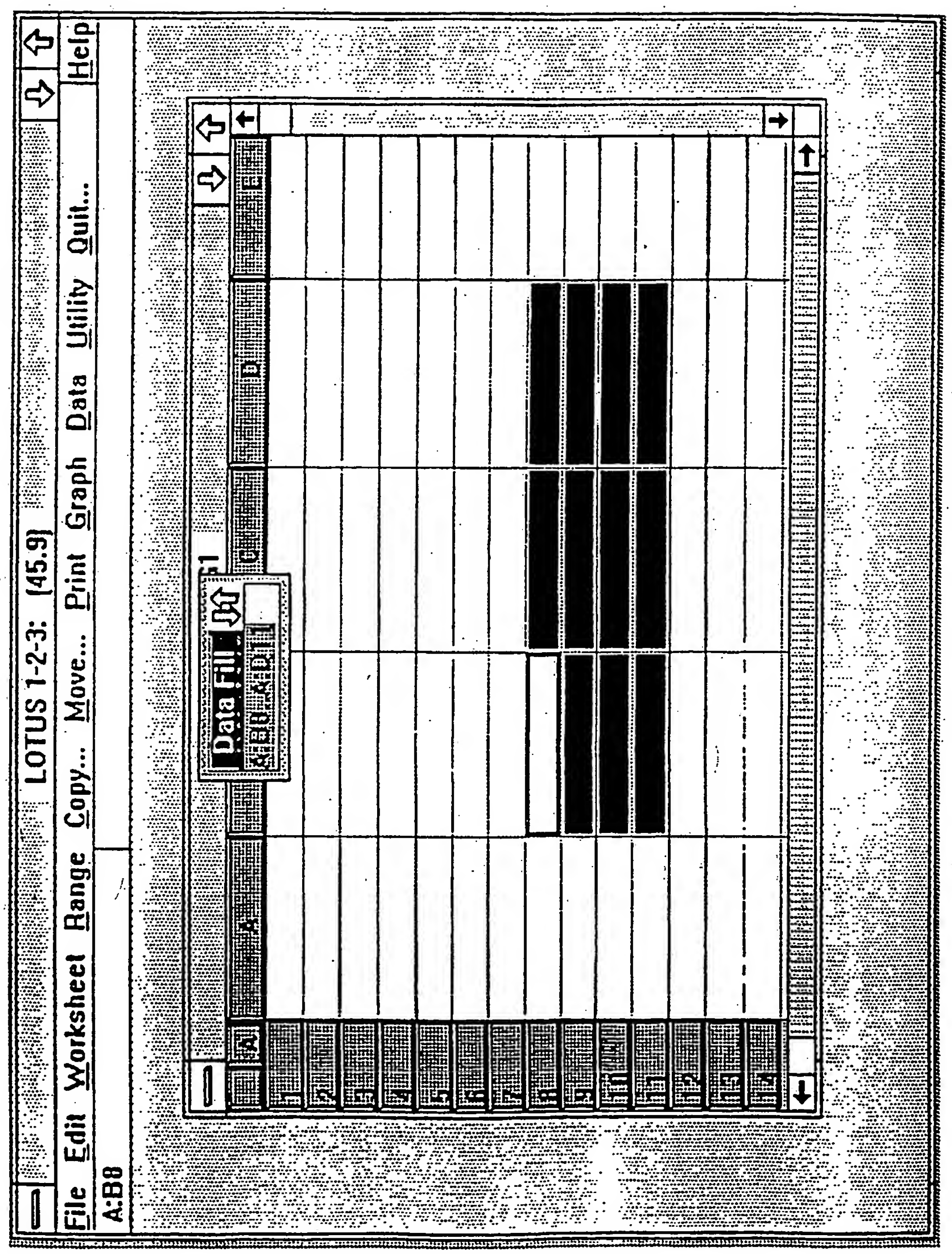
Step: 1

Stop: 32000

Series: [✓ Linear]

Order: [✓ Column]

FIG.5


LOTUS 1-2-3: [45.9]
File Edit Worksheet Range Copy... Move... Print Graph Data Utility Quit... Help
A:B8
A
A
B
C
D
E
1
2
3
4
5
6
7
8
9
10
11
12
13
14
Data Fill...
A:B8..A:D11

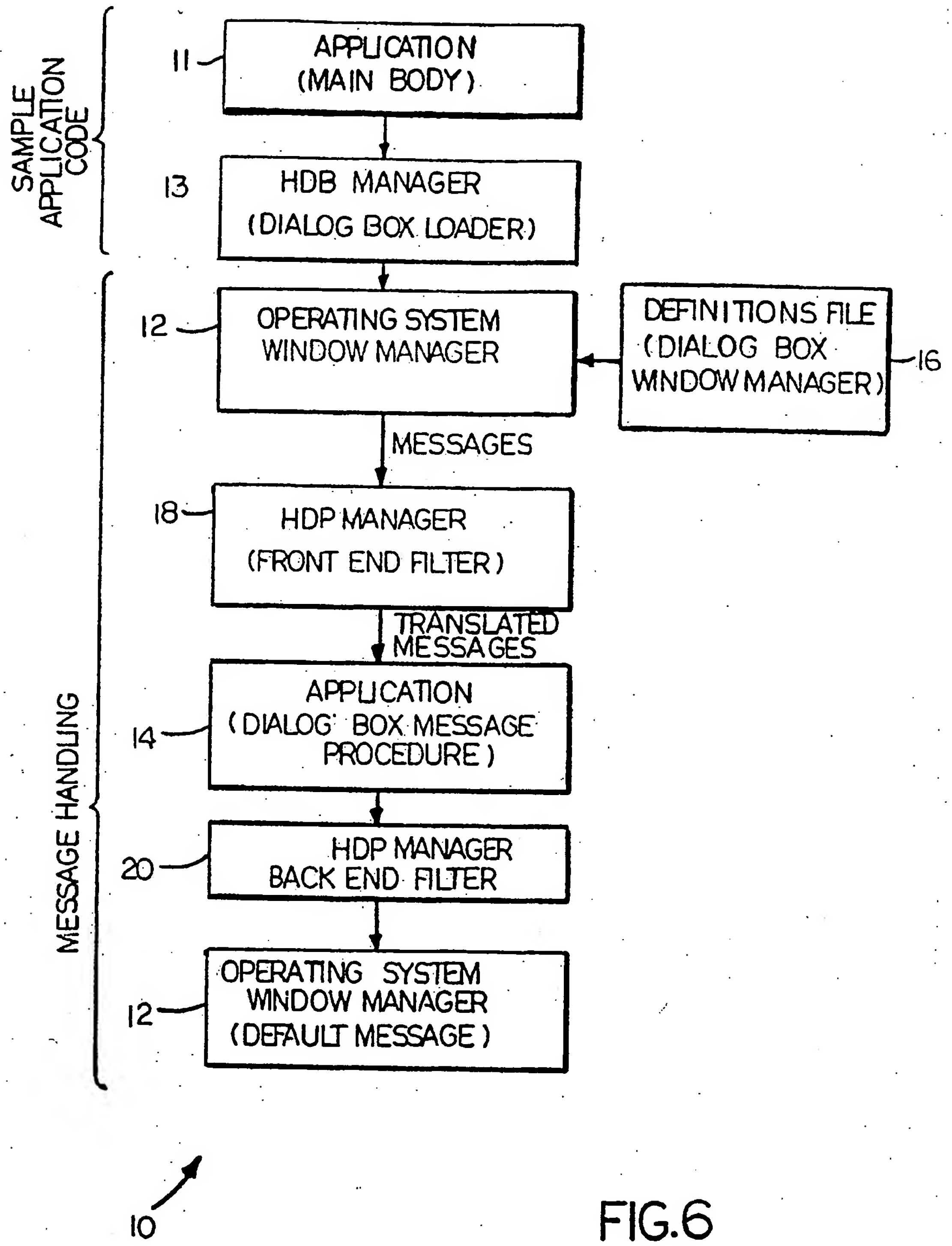

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FIG.6

Sample RC file script for a Hierarchical Dialog Box

```
#define DTemp      1
#define DBox             (2 | NCDA_HIERARCHY)
#define ID_X             (3 | NCDA_HIERARCHY)
   #define ID_A  4
   #define ID_B  5
#define ID_Y             (6 | NCDA_HIERARCHY)
   #define ID_C  7
   #define ID_D  8
#define ID_Z             (9 | NCDA_HIERARCHY)
   #define ID_E  10
   #define ID_F  (11 | NCDA_AUTOCONFIRM)


DLGTEMPLATE DTemp LOADONCALL MOVEABLE DISCARDABLE
BEGIN
   DIALOG "W", DBox, x, y, cx, cy, WS_VISIBLE,
            (FCF_TITLEBAR | FCF_DLGBORDER)
   BEGIN
        CONTROL "~X", ID_X, x, y, cx, cy, WC_STATIC,
           (SS_GROUPBOX | WS_VISIBLE | NCDS_LEVEL |
            DT_TOP | DT_LEFT | DT_MNEMONIC)
        BEGIN
            CONTROL "~A", ID_A, x, y, cx, cy, WC_BUTTON,
                 (BS_AUTORADIOBUTTON | WS_VISIBLE | WS_TAB-
STOP)
            CONTROL "~B", ID_B, x, y, cx, cy, WC_BUTTON,
                 (BS_AUTORADIOBUTTON | WS_VISIBLE | WS_TAB-
STOP)
        END
        CONTROL "~Y", ID_Y, x, y, cx, cy, WC_STATIC,
           (SS_GROUPBOX | WS_VISIBLE | NCDS_LEVEL |
            DT_TOP | DT_LEFT | DT_MNEMONIC)
        BEGIN
            CONTROL "~C", ID_C, x, y, cx, cy, WC_BUTTON,
                 (BS_AUTORADIOBUTTON | WS_VISIBLE | WS_TAB-
STOP)
            CONTROL "~D", ID_D, x, y, cx, cy, WC_BUTTON,
                 (BS_AUTORADIOBUTTON | WS_VISIBLE | WS_TAB-
STOP)
        END
        CONTROL "~X", ID_Z, x, y, cx, cy, WC_STATIC,
           (SS_GROUPBOX | WS_VISIBLE | NCDS_LEVEL |
            DT_TOP | DT_LEFT | DT_MNEMONIC)
        BEGIN
            CONTROL "~E", ID_E, x, y, cx, cy, WC_BUTTON,
                 (BS_AUTORADIOBUTTON | WS_VISIBLE | WS_TAB-
STOP)
            CONTROL "~F", ID_F, x, y, cx, cy, WC_BUTTON,
                 (BS_AUTORADIOBUTTON | WS_VISIBLE | WS_TAB-
STOP)
            CONTROL "Ok", IDOK, x, y, cx, cy, WC_BUTTON,
                 (BS_PUSHBUTTON | BS_DEFAULT | WS_VISIBLE |
WS_GROUP |
                  WS_TABSTOP)
            CONTROL "Cancel", IDCANCEL, x, y, cx, cy, WC_BUTTON,
                 (BS_PUSHBUTTON | WS_VISIBLE | WS_TABSTOP)
        END
   END
END
```

FIG.7